CLAIM AMENDMENTS

The claims are amended as follows.

27. (Currently Amended) A composite grating, comprising:

(a) an active material; and

(b) an ordered assemblage of subgratings supported by the active material for receiving input pulses along an input path and transmitting output pulses along ~~an~~ output paths, wherein

(1) each subgrating satisfies a grating condition so as to diffract a respective subbandwidth of light from the input path to one of the output paths, and

(2) the subgratings are configured such that (i) a first input optical pulse, incident to the active material along the input path and having a ~~first input address encoded or image encoded~~ first temporal waveform substantially similar to one of a plurality of address temporal waveforms encoded in the subgratings each corresponding to one of the output paths, produces an output optical pulse having a prescribed output temporal waveform and propagating along one of the output paths, and (ii) a second input optical pulse, incident to the active material along the input path and having a second ~~address encoded input~~ temporal waveform, different from any of the plurality of address temporal waveforms, ~~the first encoded address or image,~~ does not produce an output optical pulse having the prescribed output temporal waveform, and propagating along one of the output paths.

28. (Currently Amended) The composite grating of claim 27, wherein the first input optical pulse and the output optical pulse at least partially spatially overlap.

29. (Currently Amended) The composite grating of claim 28 wherein the input pulses are received along the input path in an input direction and the output pulses are transmitted along the output paths in a direction opposite to the input direction.

30. (Previously Presented) The composite grating of claim 27 wherein the prescribed output temporal waveform is a substantially temporally brief pulse.

31. (Previously Presented) The composite grating of claim 27 wherein the prescribed output temporal waveform corresponds to a substantially minimum temporal duration optical waveform.

32. (Previously Presented) The composite grating of claim 31 wherein the second prescribed temporal waveform is sufficiently orthogonal under cross correlation with the first prescribed temporal waveform as to produce substantially no substantially minimum temporal duration optical waveform from the composite grating when received thereby.

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33. (Currently Amended) The composite grating of claim 31 wherein the second ~~prescribed~~ temporal waveform is sufficiently orthogonal under cross correlation with ~~the first prescribed~~ any of the address temporal waveforms encoded in the subgratings as to produce ~~substantially no spike~~ noise from the composite grating when received thereby.

34. (Previously Presented) The composite grating of claim 27 wherein the subgratings are supported on a surface of the active material, each respective subgrating satisfying the grating condition for the respective subbandwidth of light and the input path and the output path.

35. (Previously Presented) The composite grating of claim 27 wherein the subgratings comprise spatial variations in the refractive index of the active material.

36. (Previously Presented) The composite grating of claim 27 wherein the active material is a non-frequency-selective material.

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37. (Currently Amended) An optical waveform detector comprising:

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(a) a detector capable of detecting light pulses having a prescribed detectable temporal waveform;

(b) a composite grating for receiving light pulses along an input path and transmitting light pulses to the detector along ~~an~~ one of a plurality of output paths, the composite grating comprising:

(1) an active material; and

(2) an ordered assemblage of subgratings supported by the active material wherein

(i) each respective subgrating satisfied at least one of a Bragg condition ~~or~~ and a surficial grating condition so as to diffract a respective subbandwidth of light from the input path to ~~the~~ one of the plurality of output paths, and

(ii) the subgratings are ~~so~~ configured such that an input optical pulse interacting with the active material along the input path and having a prescribed ~~address encoded~~ input temporal waveform substantially similar to one of a plurality of address temporal waveforms encoded in the subgratings, triggers an output optical pulse along one of the plurality of output paths having ~~the~~ a prescribed detectable temporal waveform, the prescribed detectable temporal waveform being different from the prescribed input temporal waveform, each of the plurality of address temporal waveforms corresponding to one of the plurality of output paths.

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38. (Currently Amended) The optical waveform detector of claim 37 wherein the subgratings are supported within a volume of the active material, each respective subgrating satisfying the Bragg condition for the respective subbandwidth of light and the input path and one of the plurality of output paths.

39. (Currently Amended) The optical waveform detector of claim 37 wherein the subgratings are supported on a surface of the active material, each respective subgrating satisfying the surficial grating condition for the respective subbandwidth of light and the input path and one of the plurality output paths.

40. (Currently Amended) The optical waveform detector of claim 37 wherein the input path and the plurality of output paths are at least partially coextensive and wherein the input pulses travel to the composite grating in an input direction and the output pulses leave the composite grating in a direction opposite to the input direction.

41. (Previously Presented) The optical waveform detector of claim 37 wherein the subgratings comprise spatial variations in the refractive index of the active material.

42. (Previously Presented) The optical waveform detector of claim 37 wherein the active material is a non-frequency-selective material.

43. (Cancelled)

44. (Previously Presented) An optical-waveform-sensitive routing system comprising:

(a) a router responsive to change the routing of data in response to an optical pulse having a prescribed detectable temporal waveform; and

(b) a composite grating for receiving input light pulses along an input path and transmitting, in response thereto, output light pulses to the router along an output path, the grating comprising an ordered assemblage of subgratings supported by an active material wherein

(1) each respective subgrating satisfies at least one of (i) a Bragg condition or (ii) a surficial grating condition so as to diffract a respective subbandwidth of light from the input path to the output path, and

(2) the subgratings are so configured such that an optical pulse received by the composite grating, interacting with the active material along the input path and having a prescribed address encoded input temporal waveform different from the prescribed detectable temporal waveform, triggers an output optical pulse along the output path having the prescribed detectable temporal waveform.

52. (Previously Presented) The composite grating of claim 27, wherein the grating condition is a Bragg condition.

53. (Previously Presented) The composite grating of claim 27, wherein the grating condition is a surficial grating condition.

54. (Previously Presented) The composite grating of claim 34, wherein the grating condition is a surficial grating condition.

55. (New) A communication system, comprising:

(a) an optical source to generate an input optical pulse; and

(b) a composite grating to receive the input optical pulse along an input path and to transmit, in response thereto, an output optical pulse along one of multiple output paths, the grating comprising an ordered assemblage of subgratings supported by an active material, wherein

(1) each one of the subgratings to diffract a respective subbandwidth of light received from the input path to one of the multiple output paths, and

(2) the subgratings are configured to

(i) transmit the output optical pulse along one of the multiple output paths having a prescribed detectable temporal waveform, if the input optical pulse includes a temporal waveform substantially similar to one of a set of address temporal waveforms encoded in the subgratings, the one of the multiple output paths determined based on the one of the set of address temporal waveforms, and

(ii) transmit noise if the input optical pulse does not include a temporal waveform substantially similar to one of the set of address temporal waveforms encoded in the subgratings.